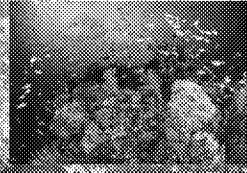
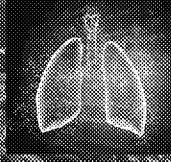
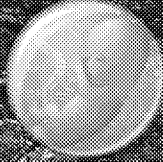
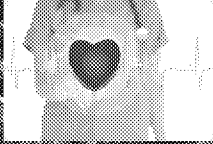


Office of Research and Development

Human Health Risk Assessment Research Program



HHRA Research Program Highlights Briefing: FY17 Q3
May 9, 2017

Tina Bahadori, National Program Director (NPD)





Today's Topics



Office of Research and Development

HHRA Research Program Highlights

- **Welcome and HHRA Transitions**
- **Science Spotlight: Dr. Tara Greaver (NCEA-RTP) *"The Ecological Impacts of NO_x/SO_x/PM characterized in the draft Integrated Science Assessment (ISA)"***
- **Project progress reports**
- **Partner feedback**

Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur, and Particulate Matter – Ecological Criteria

HHRA Highlight Briefing

Presented by Tara Greaver ORD/NCEA/NCEA-RTP

May 9, 2017

The views expressed in this presentation are those of the author and do not necessarily reflect the views or policies of the U.S. Environmental Protection Agency.

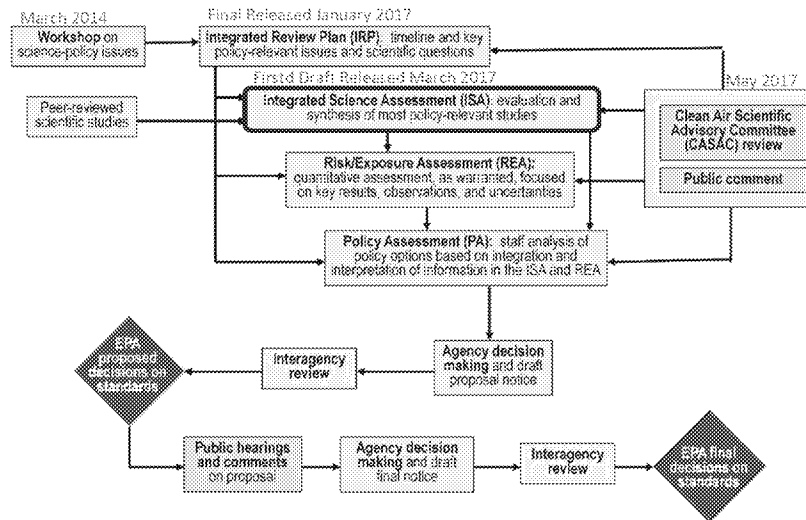
Talk outline

1. General process of National Ambient Air Quality Standards (NAAQS) review
2. Scope of the reviews
3. History of the reviews
4. Highlight of main findings of the current review

Overview of criteria pollutants

- The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for “criteria pollutants.”
- The law also requires EPA to review the NAAQS periodically and revise them if necessary to ensure that they provide the requisite amount of health and environmental protection and to update those standards as necessary.
- Primary standards are based on human health, while secondary standards are welfare based, which includes ecology
- This is the first NAAQS review to combine oxides of nitrogen, oxides of sulfur and particulate matter as a multi-pollutant review.

Overview of review process for National Ambient Air Quality Standards (NAAQS)



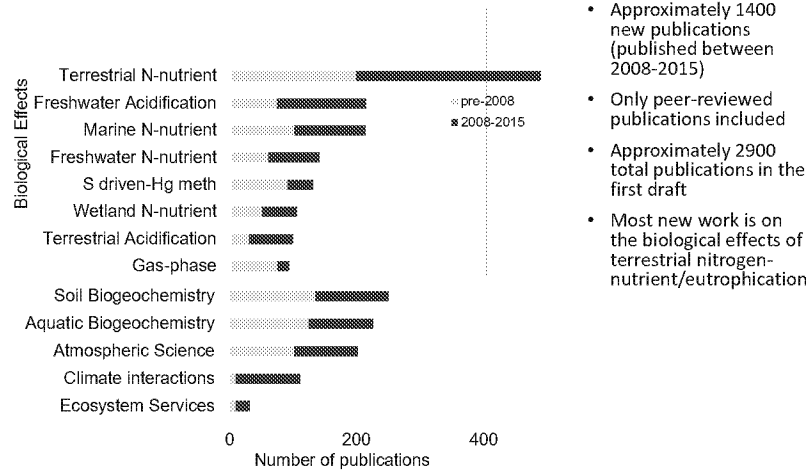
Chemical species included in the criteria pollutants categories for the NO_xSO_xPM-ECO ISA

- Oxides of nitrogen
 - Total oxidized nitrogen (NO_y) includes the transformation products from emissions of oxides of nitrogen (e.g., nitric acid and particulate nitrate)
- Oxides of sulfur
 - Total oxidized sulfur (SO_x) includes particulate sulfate (SO₄²⁻) combined with sulfur dioxide (SO₂)
- Particulate matter (PM)
 - Major components of PM include nitrate (NO₃⁻), SO₄²⁻, ammonium (NH₄⁺)

Summary of final rulemaking for oxides of nitrogen and sulfur in 2012 (ISA published in 2008)

- For direct effects of gaseous oxides of nitrogen and sulfur on vegetation:
 - retained current NO₂ and SO₂ secondary standards
 - Annual NO₂ standard (53 ppb) set in 1971
 - 3-Hr SO₂ standard (500 ppb) set in 1971
- For deposition-related effects on sensitive ecosystems:
 - Concluded that the current secondary standards are neither appropriate nor adequate to protect against such effects; however, it was premature to set a new ecologically relevant, multipollutant NO_y/SO_x secondary standard at that time

Included publications in 1st draft ISA for NOxSOxPM-Ecology



- Approximately 1400 new publications (published between 2008-2015)
- Only peer-reviewed publications included
- Approximately 2900 total publications in the first draft
- Most new work is on the biological effects of terrestrial nitrogen-nutrient/eutrophication

Main messages of 2017 draft ISA

Current NO₂ & SO₂ Secondary Standards are based on foliar injury:

- No new evidence that foliar injury is currently occurring in the U.S.

N enrichment from atmospheric deposition alters many ecosystems:

- National N deposition rates have been broadly constant; decreasing NO_y deposition in the East offset by increased NH_x deposition in the Midwest
- New quantitative evidence that current rates of N deposition cause:
 - Decreases in lichen biodiversity and herbaceous plant biodiversity
 - Positive and negative effects on tree growth and mortality
 - Increases in algal growth, loss of sensitive aquatic species
 - New thresholds of deposition (critical loads) are available for many biological effects

Acidification impacts from N & S deposition:

- S Deposition has greatly declined over the past 25 years
- Effects on fish, plants, plankton are well-documented
- Some biogeochemical recovery has been documented in the northeast

Less sensitive areas include:

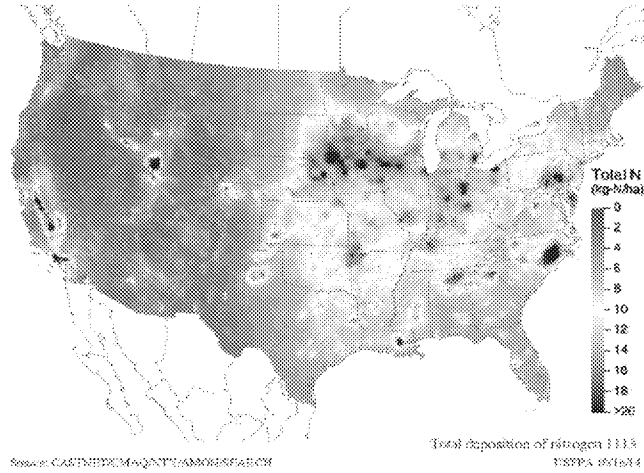
- Wetlands, estuaries, and surface waters with N inputs from agriculture and urban sources are less sensitive to N from air sources

There is coherent evidence from a small number of studies that S deposition causes increases in sulfide toxicity and mercury methylation.

Nitrogen Deposition

- Nitrogen deposition relatively constant over the last 25 years.
- Decreases in NO_3^- and HNO_3 deposition are largely offset by increases in NH_4^+ and NH_3 deposition across the U.S. (based on NADP/NTN and TDEP).

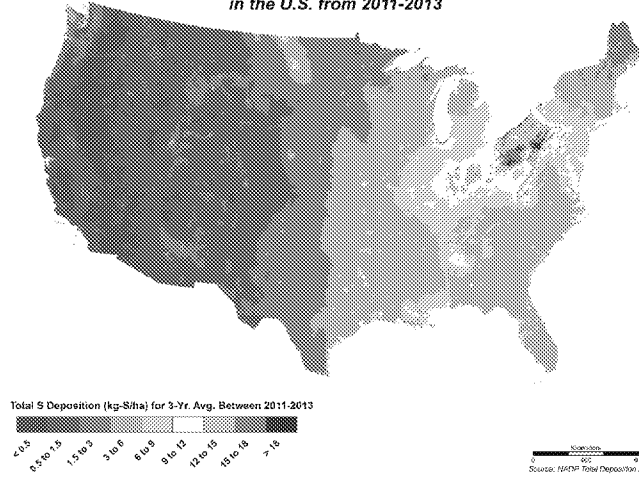
Three-year (2011 to 2013) average annual dry + wet deposition of NO_x and NH_3 species.



Sulfur Deposition

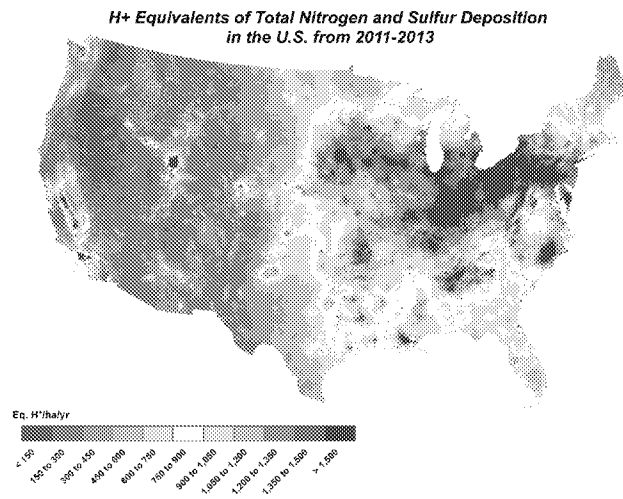
- Large decreases in S deposition mainly in the eastern U.S. (based on NADP/NTN and TDEP) over the last 25 years

*Total Wet and Dry Sulfur Deposition
in the U.S. from 2011-2013*



Acid deposition

- Acid deposition fluxes by N+S (based on NADP/NTN and TDEP) expressed as H⁺ equivalents below) are currently higher in the East than in the West



Terrestrial N enrichment effects

Sensitivity across the US

All terrestrial ecosystems are vulnerable to N enrichment, sensitivity varies with historical loading

N deposits

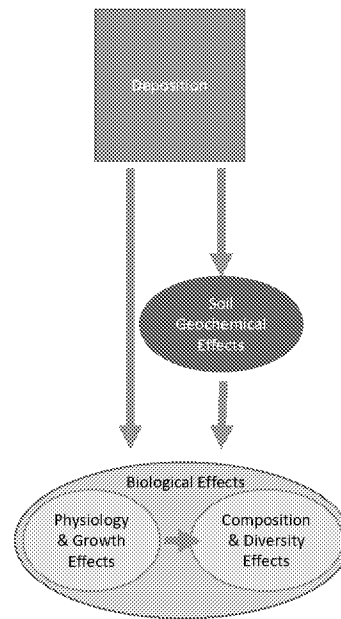
- On the biota directly
- First to the soil then to the biota

Physiological effects

- Higher growth rates of opportunistic species
- Documented effects on hundreds of species

Community/Ecosystem effects

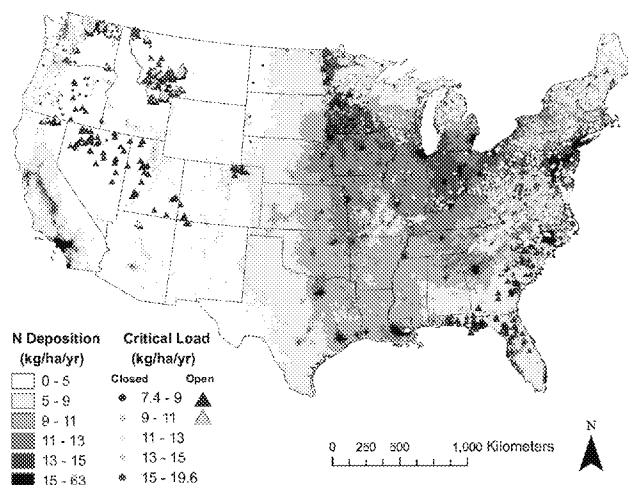
- Loss of species richness and decreases in biodiversity in communities of:
lichens, herbaceous plants, mycorrhizal fungi



Example of N enrichment effects: herbaceous plant biodiversity nitrogen critical loads

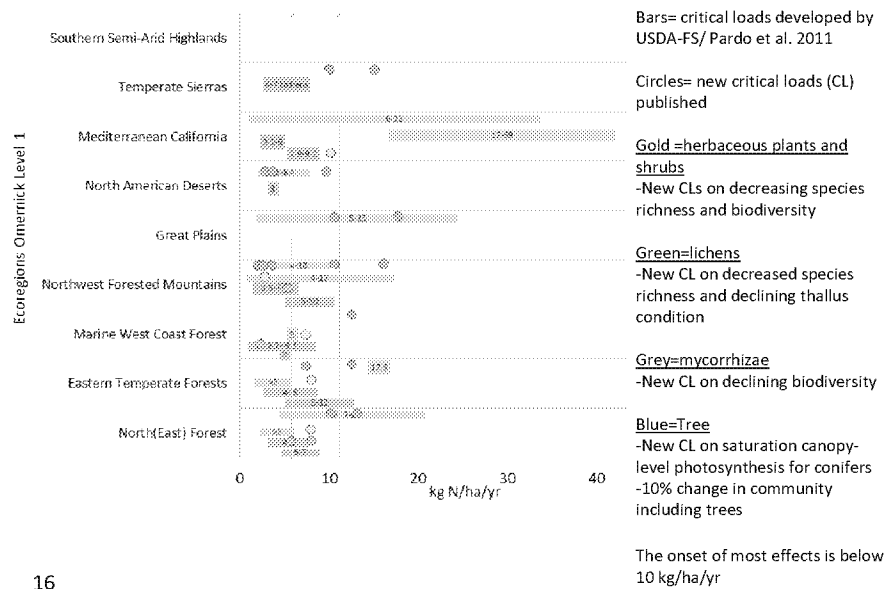
Herbaceous plants (e.g., forbs, grasses, etc.) represent a large portion of plant diversity

New critical load estimates for the onset of species loss of forbs and grasses (shown right).



Source: Simkin et al. 2016;113:4086-4091

Terrestrial nitrogen critical loads update from Pardo et al. 2011



Terrestrial acidification effects (N+S dep)

Sensitive Ecosystems

Historical deposition and geology are major factors

Soil biogeochemical effects and indicators

- Calcium to Aluminum ratio (Ca:Al) < 1.0
- Base cation to aluminum ratio (BC:Al) < 10

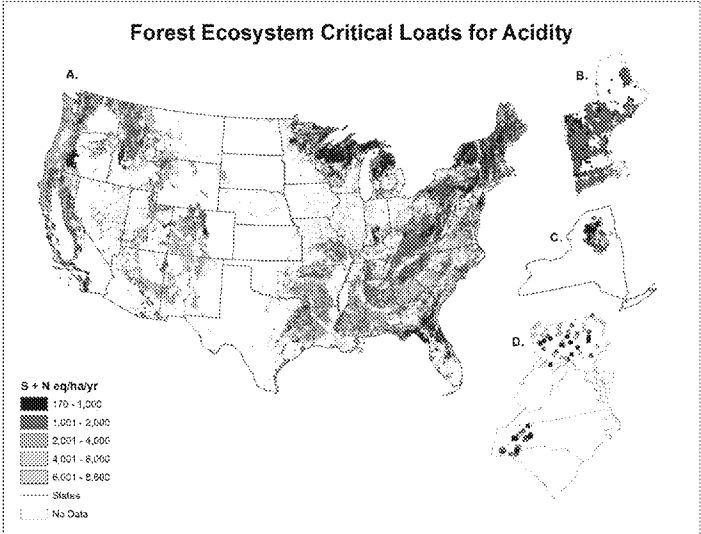
Plant Physiological effects

- Crown dieback, decrease tree growth, suppress tree seedling regeneration, and increase tree mortality rates

Community effects

- Evidence pointing to changes in forest composition in areas affected by soil acidification
- Changes found in forest understory plant community composition, grass and forb diversity

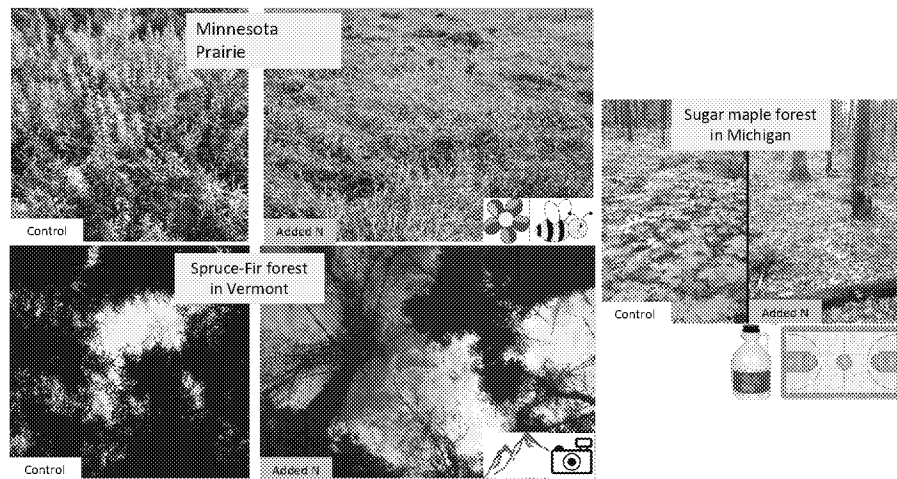
Terrestrial acidification



Source: NCLD 2015

Critical loads (as H⁺ equivalents) for soil indicators that relate to adverse effects on plants.

Effects of N & S Deposition on Terrestrial Ecosystems



Freshwater acidification (N+S dep)

Sensitive Ecosystems

Historical deposition and geology are major factors

Physiological effects

effects are primarily attributable to low pH and high inorganic Al

Community Effects

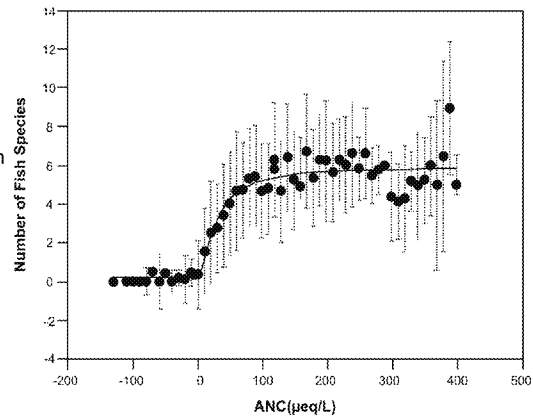
Loss of species richness/biodiversity and abundance:

Primary Producers

Zooplankton

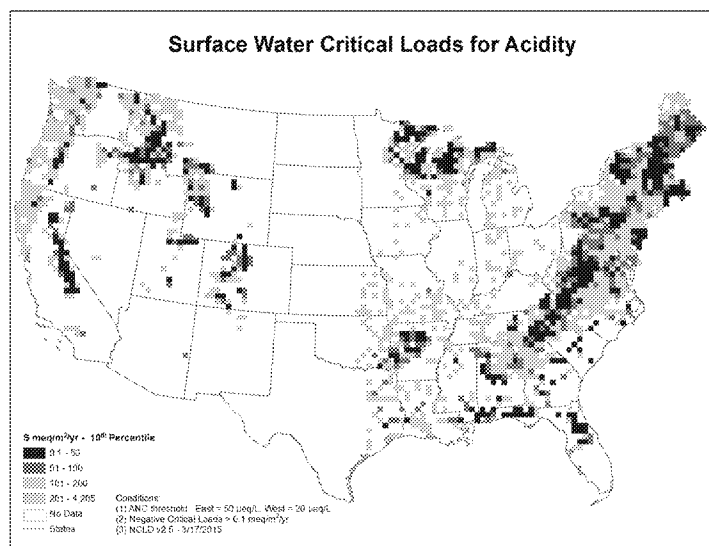
Benthic Invertebrates

Fish (threshold ANC 0-100)



Number of fish species per lake versus acidity status, expressed as ANC, for Adirondack lakes. (Sullivan et al. 2006)

Freshwater acidification (N+S dep)



Source: NCLD 2015

Map shows current critical loads (dark red = more sensitive)

Next Steps

ISA Timeline	
Clean Air Scientific Advisory Committee (CASAC) meeting to review 1 st draft	May 24-25, 2017
2 nd draft ISA targeted for public release	2018
Final	2019

NO_x-SO_x-PM Ecology ISA Team

NCEA-RTP Team

Tara Greaver, ISA lead
Emmi Felker-Quinn
Jeffrey Herrick
Meredith Lassiter
Joseph Pinto
Steve McDow
Alan Talhelm *

Adam Benson*

Ihab Mikati*

April Maxwell*

* ORISE Research Participant

Contributing Authors

Biological Effects:

Terrestrial Acidification: Jennifer Phelan⁺

Aquatic Acidification: Tim Sullivan⁺, Jason Lynch

Terrestrial N-driven Eutrophication: Mary Barber⁺, Jennifer Richkus⁺, Chris Clark

Freshwater N-driven Eutrophication: Marion Deerpake⁺, Jana Compton

Estuarine & Marine N-driven Eutrophication: Elizabeth Sullivan⁺, Marion Deerpake⁺

Biogeochemistry:

Terrestrial: Marion Deerpake⁺, Tim Sullivan⁺, Margaret O'Neil⁺

Aquatic: Tim Sullivan⁺, Jason Lynch, Jana Compton

Ecosystem Services:

George Van Houtven⁺, Jessie Allen⁺, Jana Compton

Case Studies:

Marion Deerpake⁺, Tim Sullivan⁺, Tamara Blett

NCEA Management

John Vandenberg, NCEA-RTP Director
Reeder Sams, acting NCEA-RTP Deputy Director
Steve Dutton, EMAG Branch Chief

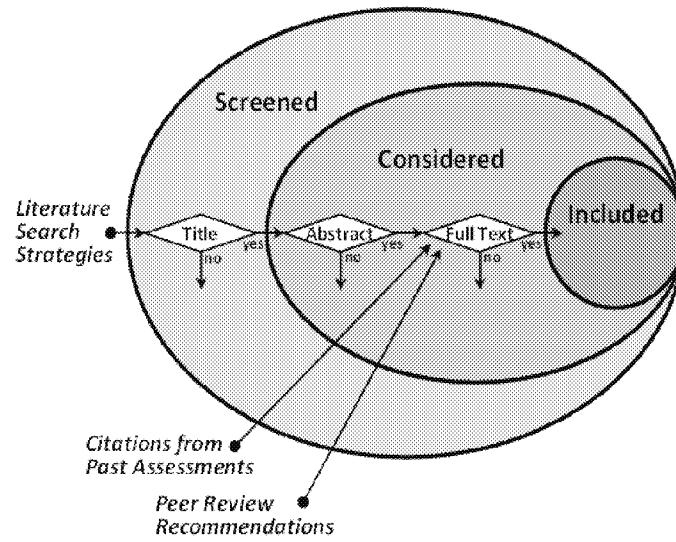
HERO Support

Ryan Jones
Connie Meacham

⁺under contract with RTI International

Supplemental Slides

Literature search strategy



N enrichment/eutrophication in freshwaters, estuaries and wetlands

Sensitive Ecosystems

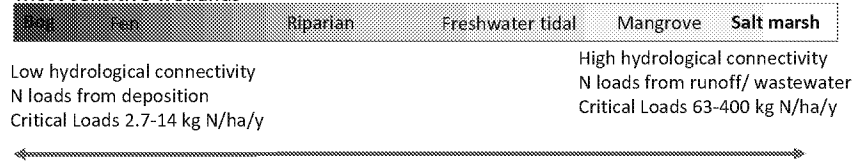
Wetlands, estuaries, and surface waters with N inputs from agriculture and urban sources are less sensitive to N from air sources. Sensitivity varies according to the amount of N from deposition vs total loading

Freshwaters: high altitude lakes/remote headwater streams are most sensitive

Estuaries: Contribution of N loading from air can be greater than 40%

Wetlands: Most sensitive are bogs and fens

Most sensitive wetlands





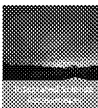
4 Topics and 9 HHRA Projects: Responding to Partner Priorities



Integrated Risk
Information Systems

..... #1) IRIS Assessments

..... #2) IRIS Update



..... #3) Integrated Science Assessments (ISAs) and Scientific/Regulatory Support



..... #4) Provisional Peer-reviewed Toxicity Value (PPRTV) Assessments

..... #5) Site-specific and Superfund Regulatory Support

..... #6) Cumulative Risk Assessment Methods and Applications



..... #7) Advancing Hazard Characterization and Dose-response Methods and Models

..... #8) Applying Emerging Science to Inform Risk Screening and Assessment

..... #9) Risk Assessment Support and Training



**Project 1 & 2 (HHRA 1.21 and 1.22):
Integrated Risk Information System (IRIS) Assessments**

HHRA FY17 Q3 May 9, 2017

Kris Thayer, PhD
Director, IRIS Division
National Center for Environmental Assessment
US EPA Office of Research and Development



IRIS Assessment Updates

Scoping and Problem Formulation	Step 1: Draft Development	Step 2: Agency Review	Step 3: Interagency Review	Step 4a: Public Comment/	Step 4b: External Peer Review	Step 5: Revise Assessment	Step 6: Final Agency/ Interagency Review
Nitrate/Nitrite (IRIS Assessment Plan for SAB Review in September 2017)	HBCD (Undergoing Internal Review)	Formaldehyde (Anticipated Summer 2017)			RDX (Awaiting Final Peer Review Report)		
Mercury/methylmercury (IRIS Assessment Plan for SAB Review in September 2017)	Chromium VI Naphthalene PCBs noncancer	Inorganic arsenic (Anticipated Summer-Fall 2017)			ETBE (Anticipated June 2017 for SAB meeting in August 2017)		
Ethylbenzene (IRIS Assessment Plan for SAB Review in September 2017)	PAH mixtures Phthalates (DINP, DBP, BBP)	Multi-Phthalate Epi (Anticipated Fall 2017) DIBP, DEP (Anticipated Fall 2017)			TBA (Anticipated June 2017 for SAB meeting in August 2017)		

Thayer HHRA IRIS Update (May 9, 2017)

- * NCEA scientists who work within the IRIS Program
- * 70+ staff attended the 3 days retreat at Potomac Yard
- * Discussed ongoing changes to the IRIS Program
- * Agenda topics included:
 - Operationalizing and harmonizing practices and workflows to implement IRIS Handbook
 - Application of systematic review software tools to enhance efficiency and transparency
 - Activity sessions to develop systematic review draft assessment plans, learn a software application, and improve writing skills for evidence synthesis narratives



Communities of Practice for Systematic Review

- Established March 2017
- Four orientation/survey meetings held in March-April
- Aiming for 1 meeting a month to promote communication, harmonization, and methodology advancements

Thayer HHRA IRIS Update (May 9, 2017)

- SOPs for conducting an IRIS assessment using systematic review
- Intra-agency review
 - March 30: Presentation and discussion
 - April 28: Due date for comments
 - May 9th: A follow-up meeting to discuss options for characterizing hazard

- Presentations and training on HERO, tools to help conduct rapid literature surveys, priority-ranking studies for relevance during screening, data extraction and visualization

HAWC
*Data Extraction &
Visualization*
April 12 (Seminar)
May 16 (Hands on
Session)

SWIFT Review/SWIFT
Active
*Problem Formulation &
Priority Ranking*
April 25 (Seminar)
April 27 (Hands on Training)

HERO
*Scientific Literature
Database*
March 13 (Seminar)
April 26 (Seminar)

- Focus on scoping and problem formulation, define user needs, and frame the scientific questions prior to draft development
 - Products from large/complex assessments may be modular
 - Typical length 10-20 pages
- Described the type of evidence considered relevant to address specific aims
 - Defined through a “PECO” statement (Populations, Exposures, Comparators, and Outcomes)

- Currently developing 3 draft assessment plans targeted for September SAB consolation
 - Methyl mercury
 - Nitrates/nitrites
 - Ethylbenzene (presented as an update to prior public scoping and problem formulation discussion)
- Summer: Intra-agency sharing of plans
- Late Summer/early fall: posting for public comment; public consultation to get input from scientists and public



Updated Health Assessments (UHAs)

- Targeted reviews that can be conducted within 6-9 months
- Pilot case examples
 - Uranium (oral)
 - Chloroform (inhalation)
 - Manganese (adult, neurological)
 - Ammonia (oral)
- Summer: Intra-agency sharing of plans
- Late Summer/early fall: posting for public comment

Thayer HHRA IRIS Update (May 9, 2017)

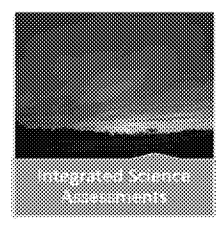
- * Provided input on guidance and scoping documents due for public release in June
 - Guidance to Assist Interested Parties in Developing and Submitting Draft Risk Evaluations
 - Strategy for Conducting Scoping-Level Literature Searches
- * Providing general assistance/guidance on implementing systematic review processes
- * Active collaboration between OPPT/RAD, ORD, OSCP

- Project 3 (HHRA 2.21) - ISAs and Scientific/Regulatory Support
PL Steve Dutton, NCEA RTP

- Task 3.1 (HHRA 2.211): Development of ISAs
TL Steve Dutton, NCEA RTP

- Task 3.2 (HHRA 2.212): ISA-Related Scientific & Regulatory Support
TL James Brown, NCEA RTP

- Task 3.3 (HHRA 2.213): ISA-Related Science Advancements
TL Jennifer Richmond-Bryant, NCEA RTP



★★★★★
"A five-star process for incorporating
science into regulatory policy."
Administrative Conference of US (2013)

– Task 3.1 (HHRA 2.211): Development of ISAs

- ISA for Oxides of Sulfur-Health Criteria (SOx-Health)
 - Dec 2016 – Released 2nd Draft SOx-Health ISA
 - Mar 2017 – Held public CASAC meeting to review 2nd Draft SOx-Health ISA
 - May 2017 – Anticipate receipt of draft CASAC Letter
 - Jun 2017 – Public CASAC teleconference to discuss letter
 - Dec 14 2017 – Court-ordered deadline to complete final SOx-Health ISA
- ISA for Oxides of Nitrogen, Oxides of Sulfur, and Particulate Matter-Ecological Criteria (NOxSOxPM-Eco)
 - Jan 2017 – Released Final Integrated Review Plan (IRP) in conjunction with OAR/OAQPS
 - Mar 2017 – Released 1st Draft NOxSOxPM-Eco ISA
 - May 24-25 2017 – Public CASAC meeting to review 1st Draft NOxSOxPM-Eco ISA
- ISA for Particulate Matter (PM)
 - Dec 2016 – Released Final IRP in conjunction with OAR/OAQPS
 - Working toward 1st Draft PM ISA release in 2018



– Task 3.2 (HHRA 2.212): ISA-Related Scientific & Regulatory Support

- Scientific and Regulatory Support for the NAAQS
 - Continued support to OAR/OAQPS and OGC for ongoing reviews including NOx, SOx, NOxSOxPM, PM
- Regulatory and Policy Support for Other Programs in FY17

<ul style="list-style-type: none"> – AO/OP* – AO/OCHPORD/NCER – OAR/OAQPS* – OAR/OTAP – ORD/NCCT – ORD/OSP* – ORD ACE Program – ORD Cross-Cuts (Climate, Children's Health, Nitrogen) – OW* – OLEM* – OCSPP/OPP – OCSPP/OPPT* 	<ul style="list-style-type: none"> – Region 6 – Region 7* – NIOSH – USDA-Forest Service and NPS (via CLAD workgroup) – CDC – DOD – California's SCAQMD – HEI – WHO – Taiwan EPA – S. Australia EPA
---	---

- *Extensive Pb-related support; more discussion to be featured by Jim Brown...





Topic 2: Integrated Science Assessments (ISA) and Scientific/Regulatory Support

– Feature: “The Many Facets of Lead ISA Applications in the Agency” – James Brown

- OAR, Office of Air Quality Planning and Standards – NAAQS assistance
- ORD, Office of Science Policy – review federal documents
- Multiple EPA offices – interested in determining an “action” or “reference level”
- Office of Land and Emergency Management (OLEM) – support Technical Review Workgroup (TRW)
- NCEA-Cincinnati Omaha Lead Study – TRW and OLEM interest
- Office of Water (OW) – modeling support
- Office of Chemical Safety and Pollution Prevention (OCSPP) – modeling support



The Many Facets of Lead ISA Applications in the Agency

– OAR, Office of Air Quality Planning and Standards – NAAQS assistance (HHRA 2.212.1)

- Ellen Kirrane (NCEA Team Lead)
- Support for Final Rule
- Response to Comments on Proposed Rule
 - Provisional Consideration of “new” studies since the ISA
 - Children’s Health Protection Advisory Committee raised several issues that were addressed in the Final Rule

Final Rule: NAAQS for Lead
FR / Vol 81, No. 201 /
Tuesday, October 18, 2016

ENVIRONMENTAL PROTECTION
AGENCY

40 CFR Part 50

[EPA-HQ-OAR-2010-0108; FRL-9952-87-
OAR]

RIN 2060-AQ44

Review of the National Ambient Air
Quality Standards for Lead

AGENCY: Environmental Protection
Agency (EPA).

ACTION: Final rule.

SUMMARY: Based on the Environmental
Protection Agency’s (EPA’s) review of
the air quality criteria and the national
ambient air quality standards (NAAQS)
for lead (Pb), the EPA is retaining the
current standards, without revision.

DATES: This final rule is effective on
November 17, 2016.

– **ORD, Office of Science Policy – review federal documents (HHRA 2.212.2)**

- Ellen Kirrane asked to comment on documents
- President's Task Force on Environmental Health Risks and Safety Risks to Children (11/2016), Status report on eliminating childhood lead poisoning
- Department of Housing and Urban Development Final Rule (2/13/17): Requirements for Notification, Evaluation and Reduction of Lead Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance; Response to Elevated Blood Lead Levels





The Many Facets of Lead ISA Applications in the Agency

– Multiple EPA offices – “action” or “reference level” (HHRA 2.212.2)

- OLEM, OW, OP’s National Center Environmental Economics (NCEE)
- CDC Reference Level 5 µg/dL (lowered from “Action Level” of 10 µg/dL) in 2012
 - Reference level is 97.5 %-tile of the distribution of blood leads in children (1–5 years of age)
 - Hesitation to base EPA guidance on a CDC reference level that may change
- EPA offices inquired about selecting 5 µg/dL based on ISA, “... .. blood Pb-associated decrements in cognitive function were found in populations of children ages 4-11 years with mean or group blood Pb levels in the range of 2 to 8 µg/dL.”
- NCEA cautioned that the range showing effects in the ISA would likely change and does not provide a scientific basis for 5 µg/dL



The Many Facets of Lead ISA Applications in the Agency

– OLEM – support Technical Review Workgroup, TRW (HHRA 2.212.2 and 3.222.2.6)

- J. Brown TRW member since 2009
- Apprise TRW and OLEM of Pb activities with NCEA involvement
- Update TRW on All Ages Lead Model (AALM) status and seek input
 - Collaborating with OCSPP to advance the AALM
- Review parameters used in EPA Integrated Exposure Uptake and Biokinetic Model (IEUBK)
- Evaluate IEUBK performance, provide suggestions for improvement
- Coordinate and mediate cross office discussion
 - Particularly for OW Health Based Benchmark for lead in water
- Great interest in Omaha Lead Site by OLEM
 - Provides low blood lead data for IEUBK evaluation



The Many Facets of Lead ISA Applications in the Agency

– NCEA-Cincinnati Omaha Lead Study (HHRA 3.222.1)

- Collaboration with NCEA-Cincinnati in support of Region 7
- E. Kirrane and J. Brown to serve as Alternate COR for Cynthia Yund
- Opportunity for NCEA-RTP to provide expertise gained from ISA and TRW related work and to gain site-specific experience
- Data collection complete: linking children's blood lead levels, academic test scores, and lead concentrations in paint and soil to specific children and residences
- OLEM is very interested in an evaluation of the IEUBK model with site data which offer lower childhood blood lead levels than a prior evaluation in the mid-90s



The Many Facets of Lead ISA Applications in the Agency

– Office of Water (OW) – modeling support (HHRA 2.212.2 and 3.222.2.6)

- Goal: determine “Health-based Benchmark” (HBB) for Pb in water as recommended by EPA’s National Drinking Water Advisory Council’s (NDWAC)
 - Reviewed multiple drafts of OW approaches to HBB
 - Drafted language acceptable to OLEM for public release of HBB on January 19, 2017
 - Next: Public meeting scheduled for June 2017
- NERL/NCEA modeling for OW
 - NERL lead population based estimates of HBB
 - » Coupled SHEDS-multimedia with IEUBK
 - Manuscript submitted to EHP (Jan 2017), revised, in review

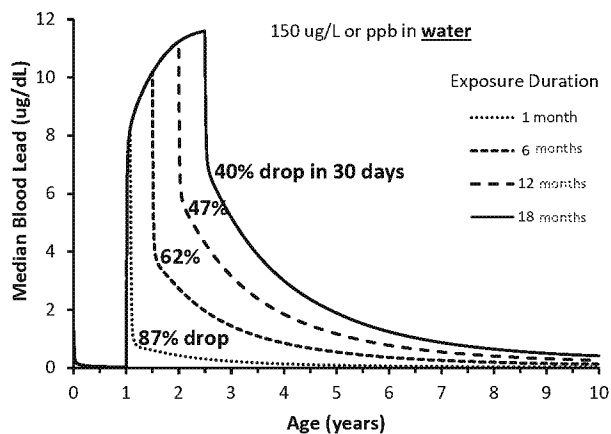


The Many Facets of Lead ISA Applications in the Agency

– OCSPP – modeling support (HHRA 2.212.2 and 3.222.2.6)

- Collaboration with OCSPP in support of Renovation and Repair Rule
- Evaluation of All Ages Lead Model (AALM)
 - Final Report November 2016
- Updating AALM documentation
 - Started February 2017
 - Describes theory, equations, and parameters

Changes in Blood Lead with Exposure Duration



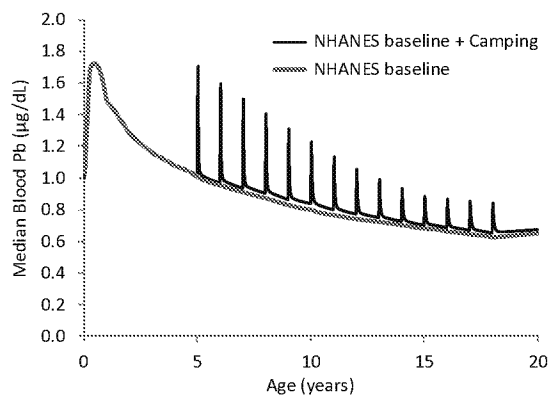
AALM simulations conducted for Tom Burke following Flint



The Many Facets of Lead ISA Applications in the Agency

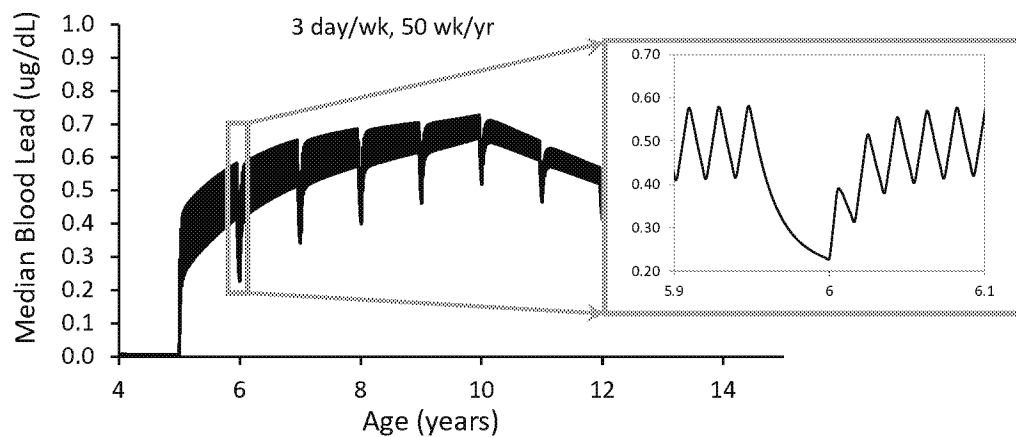
Exposure to Pb contaminated soil

400 mg/kg-soil, 2 week camping exposure each year, ages 5 to 18 years



AALM simulation conducted for Region 7

Intermittent Dust (390 ppm) Exposure



AALM simulation conducted for Cal EPA

– Recent lead related publications (HHRA 2.212.2 and 3.222.2.6)

- **Lassiter, M; Owens, EO; Patel, MM; Kirrane, E; Madden, M; Richmond-Bryant, J; Hines, E; Davis, JA; Vinikoor-Imler, L; Dubois, JJ** (2015). Cross-Species Coherence in Effects and Modes of Action in Support of Causality Determinations in the U.S. Environmental Protection Agency's Integrated Science Assessment for Lead. *Toxicology*. 330:19–40.
- von Lindern, I.; Spalinger, S.; Stifelman, M.L.; **Stanek, L.W.**; and Bartrem, C (2016). Estimating Children's Soil/Dust Ingestion Rates through Retrospective Analyses of Blood Lead Biomonitoring from the Bunker Hill Superfund Site in Idaho. *Environ Health Perspect.* 124(9):1462-1470.
- Zartarian, V.; Xue, J.; Tornero-Velez, R.; **Brown, J** (revised manuscript in review) Children's Lead Exposure: a Multimedia Modeling Analysis to Guide Public Health Decision-Making. *Environ Health Perspect.*



The Many Facets of Lead ISA Applications in the Agency

– Scientific Support Summary

- NCEA has extensive in-house expertise on Pb
- Assessment developed by NCEA-RTP provided scientific foundation for Administrator decision to reduce NAAQS from 1.5 to 0.15 $\mu\text{g}/\text{m}^3$ and the recent ISA decision was to retain this level
- Due to our recognized expertise we have been asked to provide support to multiple agency programs and regions (OAR, OCSPP, OLEM, OW, R7), primarily through review of scientific characterization of Pb in rules/guidance and via application of IEUBK and AALM models
- We have provided extensive IEUBK and AALM modeling results and collaborated with NERL and others to address key questions associated with LCR and other decisions

- **Project 4: Provisional Peer-Reviewed Toxicity Value (PPRTV) Assessments**

PL: Teresa Shannon, NCEA CIN / TL: J. Phillip Kaiser, NCEA CIN

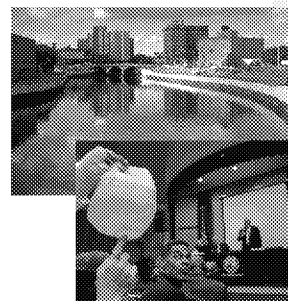
- Annually develop ≥ 12 PPRTV assessments as prioritized by OLEM.
 - Derived following a review of the relevant scientific literature using the same methods, sources of data, and guidance used by the IRIS program
 - All PPRTV assessments receive internal review by EPA scientists and external peer review by independent scientific experts.
- Status FY17 Q2
 - pCBA (para-chloro benzene sulfonic acid)
 - Chronic and subchronic oral RfD
 - Now 335 PPRTV assessment documents available online which provide 799 values
 - On target to deliver all in FY17 and FY18 already in process
- FY17: Continued application of new approaches in appendices as characterization and understanding matures





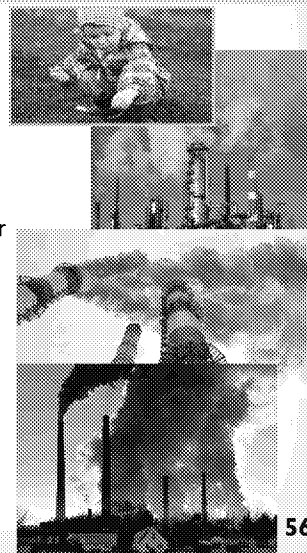
HHRA Project 5 (HHRA 3.22): Site-specific and Superfund Regulatory Support

- Project 5 PL: Teresa Shannon, NCEA CIN
- **Provides technical support, consultation and reviews for Superfund and other Agency priorities**
 - Task 5.1 (HHRA 3.221) **Quarterly reports to Superfund Technical Support Center (STSC) and Ecological Risk Assessment Support Center (ERASC)**
 - TL Teresa Shannon, NCEA CIN
 - FY17Q1 and FYQ2 delivered
 - Task 5.2 (HHRA 3.222) **Technical consultation and support on Agency priorities**
 - TLs Beth Owens, NCEA CIN and Linda Phillips, NCEA W
 - **Region 5, Manganese:** Consultation to Region 5 regarding best exposure levels (reference values) to use for an enforcement action under consent decree that mandated fence-line monitoring at a facility in East Liverpool, OH
 - 5.2.2.1 **RARE project on sampling methods for PCBs in indoor air** - Sampling completed and contract for conducting sampling closed with the delivery of a final report now housed in ORD and Region 2 (no plans to finalize as EPA report). Efforts are now underway to assess the data and craft two or more manuscripts on the data.
 - 5.2.2.3 **Technical Support for the PCBs in Schools and Other Sites** – NCEA continues to provide technical support for PCBs in Schools and other sites, by responding to questions from the program offices and regions on the PCB Exposure Estimation Tool and its use in developing exposure levels for evaluating PCBs in indoor school air. Information on the Exposure Levels for Evaluating (ELES) PCBs in indoor school air are available at the following website: <https://www.epa.gov/pcbs/exposure-levels-evaluating-polychlorinated-biphenyls-pcbs-indoor-school-air>
 - Reference Value Arrays are being drafted or updated for three chemicals (benzene [update], hydrogen chloride, and nickel); work anticipated to be completed by end FY17



- **Participation on Agency workgroups**

- Soil and dust ingestion: NCEA W consultation on exposure factors in collaboration with SHC
- OAQPS, n-Propyl Bromide (nPB): NCEA RTP Staff participated as a member of the nPB HAP-Listing Work Group convened by OAQPS
 - n-PB will be the first chemical to be added to the list of Hazardous Air Pollutants (HAPs) since the Clean Air Act 1990 amendments
 - On December 28, 2016, the US EPA issued a draft notice of the Agency's rationale for granting petitions to add nPB to the list of HAPs
- OAQPS, Risk and Technology Review (RTR) Program: NCEA RTP staff participates as work group members on a number of RTR, source-category specific regulatory actions, working collaboratively with ORD/OSP to provide an ORD-wide perspective.
 - 33 new source categories will require a review by 2020



- **PACT Meetings**

- Bi-monthly meetings with OLEM
- Bi-monthly meetings with OHHRRAF

- **Standard Operating Procedure (SOP) for chemical selection**

- Finalized October 2016 and delivered to OLEM
- Developed to codify and clearly define the process
- Increases interaction with OLEM HQ and the Regions to include scoping team
- Breaks chemical selection into two categories:
 - Standard annual process
 - “Fast-track” requests from Regions via the STSC

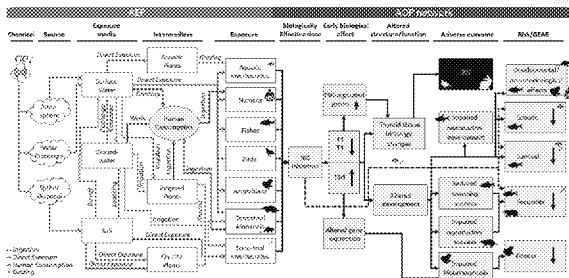
- **Status FY17 Q2:**

- 1st Call for chemicals (January 2017) to OLEM, OSRTI and ORD STL
- Scoping team will meet in March 2017 to identify and prioritize FY19 candidates



- PLs Mike Wright, NCEA CIN / Deborah Segal, NCEA W
- Task 6.1 (HHRA 3.231): **Approaches to cross-species data integration to support CRA** TL Meredith Lassiter, NCEA RTP

- Case studies illustrating utility of AEP:AOP frameworks to integrate human and ecological endpoints (e.g., the ES-GEAE) and advance mechanistic considerations
- SOT 2017 RASS Best Abstract Award – Poster (Abstract # 2827 / Poster # P229) David Hines et al. *Cross-species integration of human health and ecological endpoints using the Aggregate Exposure Pathway (AEP) and Adverse Outcome Pathway (AOP) frameworks to advance risk assessment*

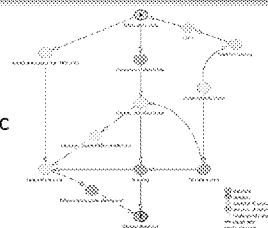


Perchlorate AEP:AOP conceptual model for integration of human health and ecological endpoints into CRA

• Task 6.2 (HHRA 3.232): Incorporating Multiple Stressors

TL Glenn Rice, NCEA CIN

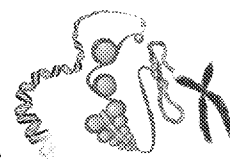
- Publication: Brewer LE; Wright LM; Rice G; Neas L; Teuschler L. (2017). Causal inference in cumulative risk assessment: The roles of directed acyclic graphs. *Environ Int*, May 102, 30-41. doi: 10.1016/j.envint.2016.12.005. Epub 2016 Dec 14.



• Task 6.3 (HHRA 3.233): Applying Genetic and Epigenetic Data to Inform Susceptibility TL TBD

– Applying Epigenetics Data to Cumulative Risk

- **Human Study:** Nonchemical Stressors, Epigenetic Changes, Susceptibility to Air Pollution Exposure, and Cardiovascular Disease (HHRA, ACE, and SHC Collaboration with NHEERL on Duke CATHGEN project): Methylated DNA sample analysis underway



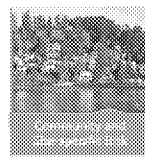
– Applying Polymorphism and Mechanistic Data to Inform Genetic Susceptibility

- **Approach and Case Study:** Use AOP Framework and Select Relevant and Data Rich AOP for Case Study: End FY17

- Task 6.4 (HHRA 3.234): **Apportioning Multimedia Exposure and Risk Across Human and Ecological Receptors**

TL Jennifer Richmond-Bryant, NCEA RTP

- One of top 5 Abstracts Award by Mixtures Specialty Section (MixSS) at the SOT 2017: Poster (Abstract # / Poster #: 3536/P511) Reyes J and Price P. *An analysis of cumulative risks indicated by biomonitoring data of six phthalates using the maximum cumulative ratio*



- Topic 4 Leads: David Bussard / Scot Hagerthey (NCEA W)
- Project 7 (HHRA 4.21) **Advancing Hazard Characterization and Dose-Response Methods**

PLs Allen Davis, NCEA CIN / Andrew Kraft, NCEA W

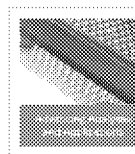
- Task 7.1 (HHRA 4.211) **Advancing Methods for Systematic Review and Evidence Integration**

TL Molini Patel, NCEA RTP

- Task 7.2 (HHRA 4.212) **Advancing Quantitative Methods** Tls John Fox, NCEA W / Karen Hogan, NCEA IRIS

- Task 7.3 (HHRA 4.213): **Advancing Methods for Benefits and Uncertainty Analyses** Tls Todd Blessinger, NCEA W / Tom Bateson, NCEA W

- Task 7.4 (HHRA 4.214): **Characterizing Determinants of Risk: Concentration, Duration and Timing of Exposure** Tls Andrew Hotchkiss, NCEA RTP / George Woodall, NCEA RTP



• **Project 8 (HHRA 4.22) Applying Emerging Science to Inform Risk Screening and Assessment**

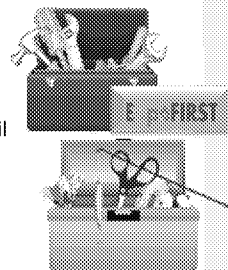
PLs John Stanek, NCEA RTP / Jay Zhao, NCEA CIN

- Exposure factors handbook updates – Internal review of the revised Chapter 5 (soil and dust ingestion) of the Exposure Factors Handbook was completed. An external review draft has been prepared and will undergo peer review during April/May.
- Eco-Box – The internal review period has officially ended. Currently addressing internal review comments. No release date yet since new websites are on hold. Linda Phillips will be doing a webinar on Eco-Box for the ERAF in mid-May.
- Food consumption rates tool – Internal review of the test site has been completed. External peer review is expected in May.

• **Project 9 (HHRA 4.23) Risk Assessment Support and Training**

PLs Maureen Johnson, NCEA IO / Molini Patel, NCEA RTP

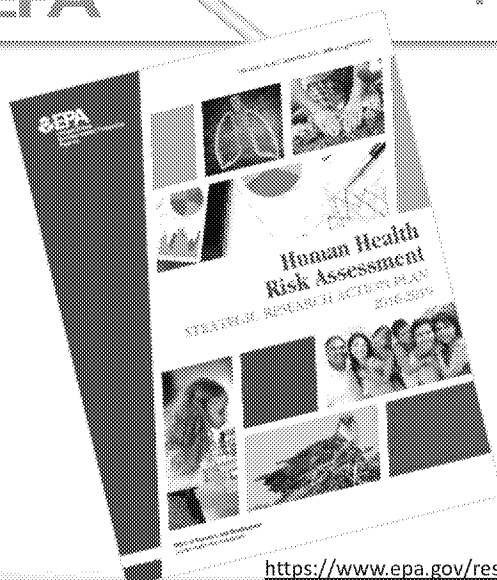
- EPA Launched a new web template in Dec 2016, RISK, IRIS, ISA, and ERASC were updated. Migration of HERO and PPRTVs apps are still in development
- Eco-Box underwent internal review, currently in final steps prior towards deployment
- Launch of 2 ISA drafts in FY17
- Launching 3 web-based RATE modules by end FY17





Other HHRA Outreach and Technical Support

<i>HHRA Bulletin</i>	<ul style="list-style-type: none">• Monthly to bi-monthly updates about all HHRA program activities• Membership grew from 0 in 2012 to 12,854 in November 2016
<i>Benchmark Dose Software (BMDS)</i>	<ul style="list-style-type: none">• Periodic updates on new BMDS versions; including new categorical regression (CatReg) module, new developments activities such as model averaging, and training opportunities• Membership is 5,519 as of November 2016
<i>IRIS</i>	<ul style="list-style-type: none">• Updates as needed on IRIS Program activities• Membership grew from 700 in 2012 to 3,287 in November 2016
<i>EPA-Expo-Box</i>	<ul style="list-style-type: none">• Periodic messages on updates, new features and helpful tips; most recent message sent September 2016 to announce release of ExpoFIRST• Membership grew from 0 in 2013 to 1,215 in November 2016



- Provides a portfolio of assessment products for improved public health
- Identifies issues and advances approaches to arrive at solutions
- Applies new technologies and data to refine analyses
- Supports communities with cumulative risk characterization of multiple stressors on human and ecological health
- Educates and engages stakeholders to build capacity

<https://www.epa.gov/research/strategic-research-action-plans-2016-2019>